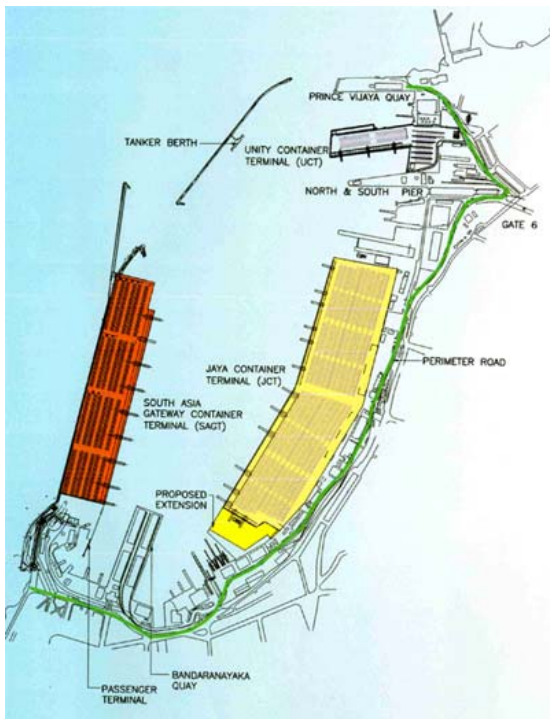


Exercise Colombo

Course year 2008



At current levels of growth, the existing port facilities will reach capacity by 2010. Therefore in order to maintain the Port's status as a key regional hub for maritime services, the Government of Sri Lanka and the SLPA are embarking on a major expansion of the Port of Colombo.

Under this project a new outer deepwater harbour enclosed by new breakwaters to cater for the next generation of ships will be constructed by the SLPA through funding from the Asian Development Bank (ADB). The planned development will take place under the port expansion project adjacent to the current Port of Colombo. The construction of the basic infrastructure will be followed by the construction of three terminals in stages, as the traffic increases. The first state-of-the-art terminal will be constructed as public/private enterprise on BOT basis.

These developments will realise the SLPA's vision for the future prosperity of the Port of Colombo by capturing the potential for transshipment in partnership with the international shipping community. The clear objective is to retain the position of the Port of Colombo as a key maritime hub for future decades.

The Port of Colombo is located in an artificial harbour formed by three breakwaters, constructed more than a century ago. The port basin covers 200 hectares and is dredged to depths of up to 15 meters. Access to the harbour is provided on the western and northern sides. The entire perimeter of the harbour is occupied with berths, terminals and vessel related activities. The Port is connected to the national rail network; however, virtually all cargo movements in and out of the port are by road.

For further information see:
<http://www.slpa.lk/expansionproject/>



For the expansion a full new port, west of the existing port has been developed, and is now open for tender. As you may see in the tender documents, the plan is to make a breakwater with Core-locs. However, alternative solutions might be interesting.

For this exercise the breakwater has to be designed for a 1/100 (or 1/200) survival condition; for the container stockyard sections a 1/10 operation condition should be used.

Boundary conditions

For an overview of internet sources of information is referred to the Knowledge Centre Water:
http://www.library.tudelft.nl/civiel/information_resources/water/index.htm Under the heading "data" information on data sources is available

For detailed information regarding the bed topography is referred to the digital nautical map, available in the TU-Delft map room (opposite to the faculty library in the building for architecture). Also you may use the printed nautical charts available in the TU map-room

Tidal information is available from various sources, for example the admiralty tide tables (library) or the website of the UK hydrographic office (only one week) or the French hydrographic office (nearest station Galle). There is also info from:

<http://www.eri.u-tokyo.ac.jp/namegaya/sumatera/tide/data/COLOMBO.CTL>

For waves you should use three sources:

- The Global Wave Statistics (available in the citg library, relevant pages (area 60) are on blackboard)
- The Argoss database (www.waveclimate.com)

For the Argoss database a password is required. The password will be given during the instruction session.

For the transformation of waves from deep to shallow water you may use Swan 1D.

For the calculation of the armour units you may use Breakwat. In Cress you will also find a routine for application of the Goda method for vertical wall breakwaters. Breakwat can be accessed via the student network Start → Programs → Delftchess → Breakwat3.1

On Thursday every group will:

1. Give an oral presentation, explaining the cross sectional profile of the both sections of the breakwater, including the choices made. The total duration of the presentation should be maximum 10 minutes, followed by 15 minutes of questions by other groups.
2. All groups present will comment on the presentations of other groups.
3. You have to hand in a drawing with a design of two cross-sectional profiles of the breakwater. On the drawing the contractor has to be able to find sufficient information regarding:
 - weight of armour units
 - slopes
 - crest height
 - toe
 - sub-layers
4. Additional information plus explanation of the choices has to be presented in a short report. The total size of the report-text should be less than 5 pages (figures are additional to the 5 pages).

For each group is given the design life time (50 or 100 years) and the allowable probability of failure during the lifetime of the construction (20% and 10%). Please give also your comments on these figures (do you recommend these figures ?)

Armour	20% - 50 yrs	10% - 100 yr
Natural Stone	1	12
Single layer of cubes	2	13
Double layer of cubes	3	14
Tetrapods	4	15
Core Loc	5	16
Dolos	6	17
X-bloc	7	18
Accropod	8	19
Berm breakwater	9	20
Monolithic caisson	10	21
Submerged berm and low	11	22

Make calculations with a classical approach, see if you can use PIANC guidelines, and see if it is possible (and useful) to make a full probabilistic approach.

Presentation on Thursday morning are in room 2.98 (starting at 8:45); on Thursday afternoon in room TUD24 BK (faculty of Architecture), 1st floor, just above the entrance (starting 13:00). The groups with code M should be present in the morning, the groups with code A should be present in the afternoon.